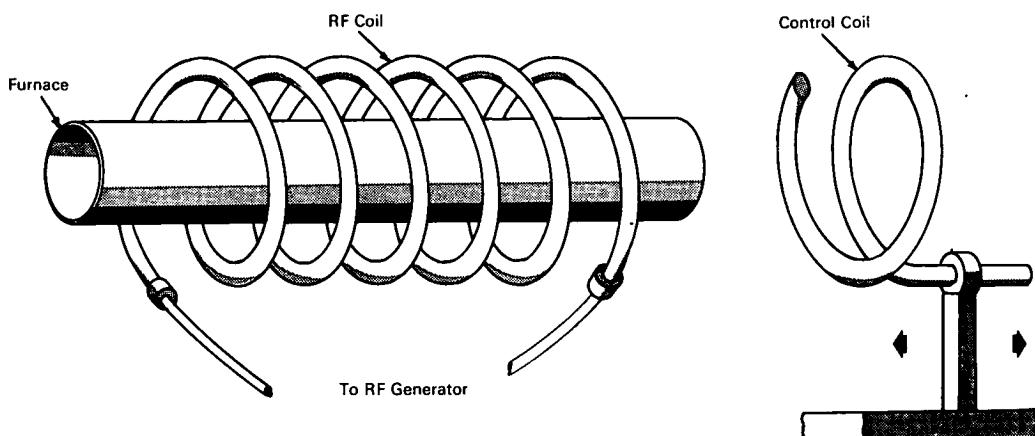


NASA TECH BRIEF



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Auxiliary Coil Controls Temperature of RF Induction Heater



The problem:

To devise a method of controlling the temperature of an RF induction furnace that is powered by a relatively unstable RF generator. The control mechanism should not operate to vary the power output of the RF generator in order to achieve the desired temperature stability. Automatic control circuits which have been described in the literature regulate the temperature of RF induction heaters by making small adjustments in the power output of relatively expensive, stable RF generators.

The solution:

The heater temperature is controlled within narrow limits ($\pm 0.1^\circ\text{C}$ over 4-hour periods and $\pm 0.02^\circ\text{C}$ over 5-minute periods in the temperature range of 100° to 500°C) by placing an auxiliary coil in close proximity to the RF coil. Manual or servoed adjustment of the relative position of the auxiliary coil changes the lossiness of the RF coil and hence the corresponding heating effect of its RF field.

How it's done:

The auxiliary or control coil consists of 0.25-inch copper wire wound in a single turn having a diameter equal to that of the RF coil. The control coil is mounted coaxially with respect to the RF coil at a nominal distance of approximately 1 inch between the coils.

In preliminary tests using an iron furnace tube 3 inches long by 1.5 inches in diameter, it was found that an approximately 10-mil displacement of the control coil altered the furnace temperature by approximately 0.1°C in the range of 100° to 500°C . Control sensitivity increased with temperature in this range.

Notes:

1. Automatic movement of the auxiliary coil by a servomechanism controlled either by an error signal relative to the desired temperature (thermocouple voltage) or by the error signal in combination with the time derivative of the error signal should allow temperature stabilities of 0.001°C .

(continued overleaf)

2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland, 20771
Reference: B66-10067

Patent status:

No patent action is contemplated by NASA.

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